PROC. ENTOMOL. SOC. WASH.
96(4), 1994, pp. 701–712

REVISION OF THE MYRMECOMORPHIC PLANT BUG GENUS *SCHAFFNERIA* KNIGHT (HETEROPTERA: MIRIDAE: ORTHOTYLINAE)

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Abstract.—The myrmecomorphic plant bug genus *Schaffneria* is reviewed, the species *S. hungerfordi* Knight is synonymized under *S. davisi* Knight, and *S. bureni* Knight and *S. schaffneri* Knight are synonymized under *S. pilophoroides* (Knight). The genus and the two included species are redescribed, new host and distribution records and comments on ant mimicry are provided, and the relationship of *Schaffneria* to other genera is discussed.

Key Words: Heteroptera, Miridae, *Schaffneria*, synonymy, distribution, hosts, habits, ant mimicry, North America

Miridae of the ceratocapsine genus *Schaffneria* Knight are remarkable in their resemblance to certain species of ants. Until recently, little was known of their habits. Knight (1966) proposed the genus *Schaffneria* to accommodate *Pamillia davisi* Knight, known only from New Jersey; *Ceratocapsus pilophoroides* Knight, known only from Kansas; and his new species *Schaffneria bureni* from Louisiana, *S. hungerfordi* from Michigan, and *S. schaffneri* from Texas. The last-named species was discovered by the lygaeid specialist M. H. Sweet (Texas A&M University, College Station), who found specimens running on the ground in a dry juniper habitat and speculated that these bugs might be feeding on fallen cedar fruits, a habit that would be highly unusual for mirids. As a consequence of Sweet and J. C. Schaffner's (also Texas A&M University) observations, Knight (1966) entitled his paper "*Schaffneria*, a new genus of ground dwelling plant bugs . . . ." In that paper, Knight also speculated that these bugs were ". . . perhaps associating with ants." Kelton (1980) later reported *S. davisi* from Manitoba and *S. schaffneri* from Alberta and Saskatchewan, considerable range extensions for both species.

It was not until Wheeler's (1991) work on the mirids of scrub oak, *Quercus ilicifolia* Wangenh., that more life-history information on these interesting mimetic bugs became available. During his research on pitch pine-scrub oak barrens in the Eastern United States, he discovered that both *S. davisi* and *S. pilophoroides* (as *S. schaffneri*) are closely associated with *Dolichoderus* ants tending certain species of aphids.

Primarily because of specimens collected by Wheeler and those accumulated through our combined fieldwork, I have been able to reevaluate the species of *Schaffneria*. Study of the types has allowed me to determine that three of the five described species are junior synonyms. In this paper I synonymize *S. bureni* and *S. schaffneri* under *S. pilophoroides* and *S. hungerfordi* under *S. davisi*, diagnose and redescribe *S. davisi* and *S. pilophoroides*, provide new host and distribution records, and discuss habits and the relationship of *Schaffneria* to other genera of Ceratocapsini.

Schaffneria Knight

Schaffneria Knight, 1966: 1. Type species: *Schaffneria schaffneri* Knight, 1966, a junior synonym of *Ceratocapsus pilophoroides* Knight, 1930. Original designation.

Diagnosis.—This genus is unique in having the combination of a posteriorly flared and convex pronotum, apically broadened hemelytra, the irregular dulled band through the middle of the corium and clavus, a polished cuneus and area of the corium outside the radial vein, the reduced male genital aperture, and the sickle-shaped left and reduced right paramere.

Description.—Orthotylinae: Ceratocapsini. Myrmecomorphic. Length 2.80–3.80 mm. Head subtriangular in dorsal aspect, elongate in lateral aspect, impunctate, basal margin straight, sharply but narrowly carinate, basal angles of eyes weakly rounded, eye elongate oval in lateral aspect, occupying half or more of head, buccula narrow, extending nearly to base of head, rostral opening between bucculae broadly rounded to contain all but apex of thickened rostral segment I. Antenna evenly thickened, except for gradually narrowing basal half of segment II. Pronotum trapeziform, impunctate, shiny, broadly flared posteriorly, posterior width much broader than anterior width, lateral margins broadly concave from humeral to anterior angle, disc moderately to strongly convex, each anterior angle with an erect, bristlelike seta. Scutellum triangular, shiny, impunctate, arched upward from base to meet posterior margin of pronotum, apical half flattened to weakly swollen or bulbous. Hemelytra subparallel on basal half, broadly flared from apical half of corium to base of cuneus giving basal half a constricted appearance; clavus and all of corium inside and basal area outside radial vein appearing dull or matlike at stereoscopic microscope magnifications of 63 × or less (Figs. 4, 12), actual cuticular surface thickly covered by numerous tiny spicules (Fig. 13); narrow band through middle of corium and clavus (dulled area) with a glaucous sheen, cuneus and most of corium outside of radial vein polished; surface with a few scattered, short, erect, bristlelike setae. Ventral surface polished, except for the glaucous metapleural area above the ostiolar peritreme and coxae. Male genital capsule with a relatively small, shallow, circular aperture, dorsal edge irregularly tuberculate. Left paramere slender, sickleshaped; right paramere short, sickleshaped to apically flared; phallotheca thickened, apically truncate.

Remarks.—The relationships of genera within the Orthotylinae are poorly understood, making it difficult to place *Schaffneria* in a phylogenetic context. Knight (1966) placed *Schaffneria* in the tribe Ceratocapsini with the genera *Ceratocapsus* Reuter, *Pamillia* Uhler, and *Pilophoropsis* Poppius. Although the tribe has been recognized in a number of recent papers (e.g. Henry 1979, 1985, Carvalho et al. 1983, Henry and Wheeler 1988), it also has been considered a synonym of Orthotylini (Carvalho 1958, Schuh 1974). Schuh (1974) characterized what he called the *Sericophanes* group for genera with a well-developed collar, some degree of ant resemblance, usually lacking spiculi, hemelytra often with maculae or faciae, and restricted to the Western Hemisphere (with the exception of *Xenofulvius* Bergroth known from the Philippines). Schuh's group includes essentially the same taxa that are now placed in Ceratocapsini, plus the genus *Sericophanes*. Until a comprehensive cladistic analysis of the Orthotylinae (now underway) can be performed, I am maintaining Ceratocapsini to include the above genera, as well as a number of other New World taxa such as *Eurotus* Distant, *Marinonicoris* Carvalho, *Renodaeus* Distant, *Zanchisme* Kirkaldy, and the genera discussed below.

Knight (1966) commented that *Schaffneria* was allied to *Pamillia* Uhler and could be distinguished by the polished areas of the corium and cuneus (versus frosted or pruinose in *Pamillia*) and the strongly convex pronotum (versus slightly convex in *Pamillia*). Both genera have a similar myrmecomorphic habitus, a characteristic shared by many Ceratocapsini as noted above and appearing convergently in numerous other subfamilies and tribes of the Miridae (e.g. Wheeler and Henry 1980, Schuh 1984, Polhemus and Polhemus 1985, McIver and Stonedahl 1993). *Schaffneria* and *Pamillia* also share a reduced genital aperture, sickle-shaped left paramere, and stout, apically truncate phallotheca, placing them near several other ceratocapsine genera and species groups such as *Ceratocapsella* Carvalho and Schaffner, *Tucuruiella* Carvalho, and the *Ceratocapsus punctulatus* group.

Schaffneria davisi (Knight)

Figs. 1–9; map 1

Pamillia davisi Knight, 1923: 535.

Pamilia [sic] *davisisi* [sic]: Carvalho, 1958: 121.

Schaffneria davisi: Knight, 1966: 3; Kelton, 1980: 213; Henry and Wheeler, 1988: 400; Wheeler, 1991: 424.

Schaffneria hungerfordi Knight, 1966: 3; Henry and Wheeler, 1988: 400. **NEW SYNONYMY.**

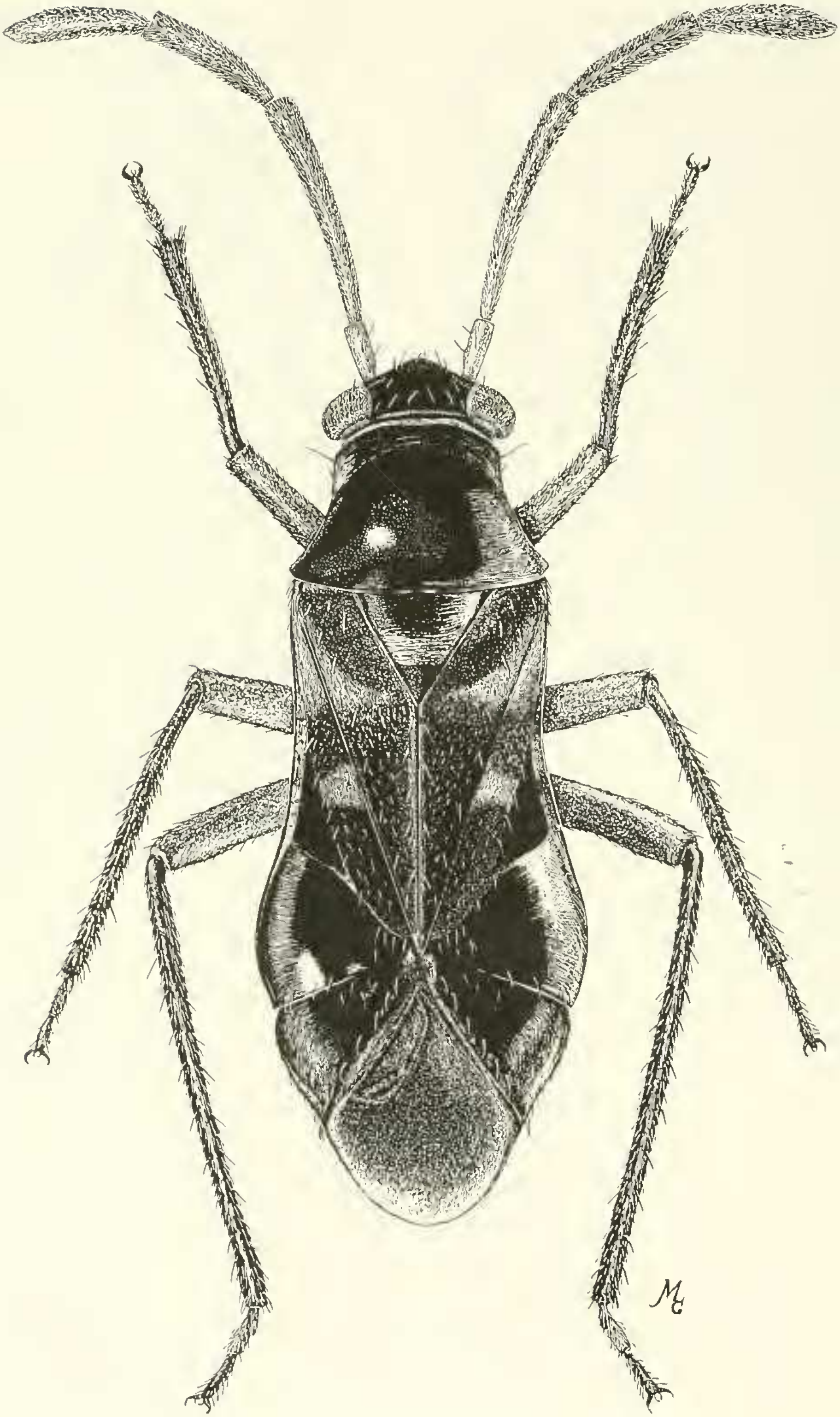
Diagnosis.—*S. davisi* is distinguished from *S. pilophoroides* by the greater length, broader body form, shorter 2nd antennal segment that is shorter than the basal width of the pronotum, the shorter 3rd antennal segment that is shorter than the width of the head, the flattened scutellum that is level with the hemelytra, and quite different broad, apically truncate right paramere.

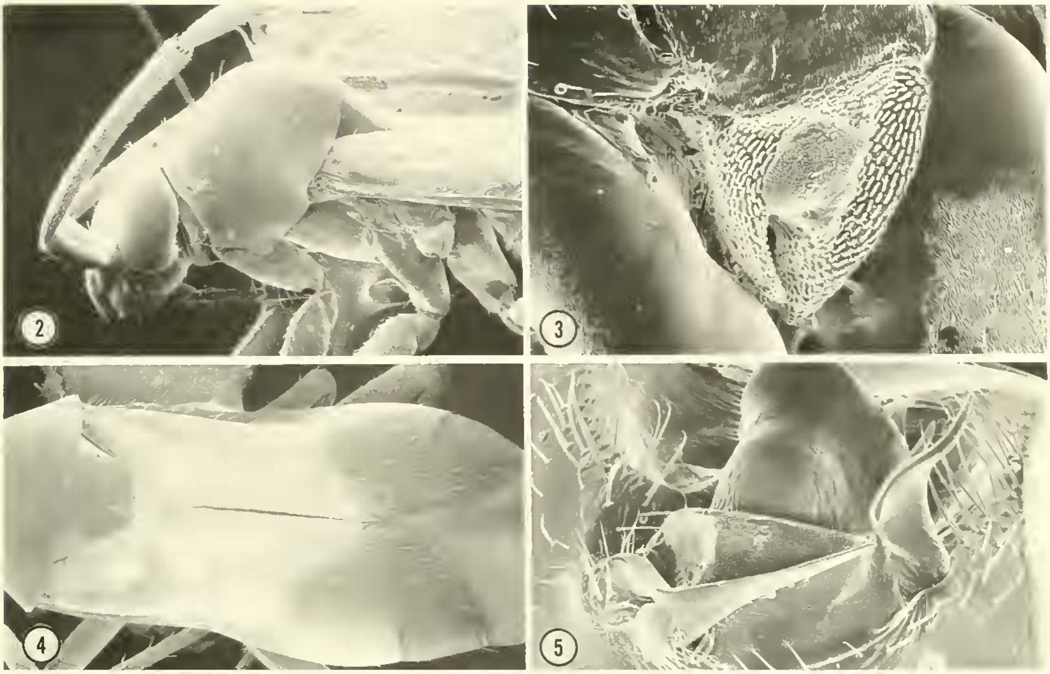
Although Knight (1966) said in his key that *S. davisi* could be separated from *S. hungerfordi* by the wider vertex and slightly thicker antennal segment III, my study of the types and other specimens indicates that Knight apparently mismeasured the head characters. The diameters of the antennal segments are variable and do not support the recognition of two species. The male genitalia of the holotypes also are indistinguishable and indicate that *S. hungerfordi* should be placed as a junior synonym of *S. davisi*.

Description.—*Male* (n = 10): Length 3.52–3.80 mm, basal width 1.08–1.18 mm, width across widest part of corium 1.36–1.46 mm. *Head:* Width 0.84–0.86 mm, vertex 0.38–0.42 mm. *Rostrum:* Length, 1.30–1.36 mm, extending to middle coxae. *Antenna:* Segment I, length 0.30–0.32 mm; II, 1.04–1.10 mm; III, 0.64–0.70 mm; IV, 0.60–0.66 mm. *Pronotum:* Length 0.80–0.86 mm, anterior width 0.72–0.74 mm, posterior width 1.16–1.18 mm.

Female (n = 10): Length 3.52–3.84 mm, basal width 1.12–1.16 mm, width across widest part of corium 1.50–1.58 mm. *Head:* Width 0.88–0.90 mm, vertex 0.42–0.44 mm. *Rostrum:* Length 1.30–1.34 mm. *Antenna:* Segment I, length 0.28–0.30 mm; II, 1.02–1.06 mm; III, 0.64–0.66 mm; IV, 0.62–0.66 mm. *Pronotum:* Length 0.80–0.88 mm, anterior width 0.76–0.80 mm, posterior width 1.14–1.18 mm.

General coloration black to reddish brown. Head black to reddish brown, surface finely grained or alutaceous, with a few scattered short, erect, bristlelike setae. Antennal segments almost uniformly thickened, segment II gradually narrowed toward base; segment I yellowish brown, even on dark color forms, segments I, III, and IV fuscous. Pronotum black to reddish brown, impunctate, surface shiny, weakly alutaceous, nearly glabrous, except for a long, erect, bristlelike seta at each anterior angle and a few scattered short setae around basal and lateral margins, disc strongly swollen or





Figs. 2–5. Scanning electron microscope micrographs of *Schaffneria davisi*. 2, lateral aspect of head, pronotum, and scutellum (54.2×). 3, peritreme and ostiolar evaporative area (278×). 4, dorsal aspect of hemelytra (46.3×). 5, caudal aspect of male genital capsule (212×).

convex, raised well above anterior half or level of hemelytra. Scutellum black to reddish brown, basal half strongly arched upward to meet basal margin of convex pronotum, posterior half level with hemelytra; apex dulled, texture similar to dulled hemelytral surface. Hemelytra uniformly black or fuscous to bicolored (i.e. reddish brown on basal half, fuscous to black apically); lateral margins of basal half subparallel, apical half beginning at middle of corium broadly flared around to cuneus; clavus and basal half of corium appearing dull or matlike (Fig. 4), but see Fig. 13; middle of clavus and basal area of corium with a glaucous sheen, set with short recumbent, pale setae; area outside of radial vein polished, including embolium, apical half of corium, and all of cuneus; membrane and veins fumate to fuscous, narrowly pale along edges bordering cuneus and around apical margins. Ventral surface shiny to polished; abdomen always polished black, with a large, quadrate, glaucous patch across segment III, ending before lateral margins; thoracic sterna fuscous to reddish brown; ostiolar peritreme whitish. Legs fuscous to reddish brown; tarsomere I, basal half of tarsomere II, and apices of coxae pale. Male genitalia: left paramere (Fig. 6); right paramere (Fig. 7); aedeagus and phallotheca (Fig. 8); dorsal edge of aperture (Fig. 9).

Remarks.—The color polymorphism found in *S. davisi* is remarkable. Populations of this species in Pennsylvania that were found running with the entirely black ant *Dolichoderus taschenbergi* Mayr are entirely black, whereas populations discov-

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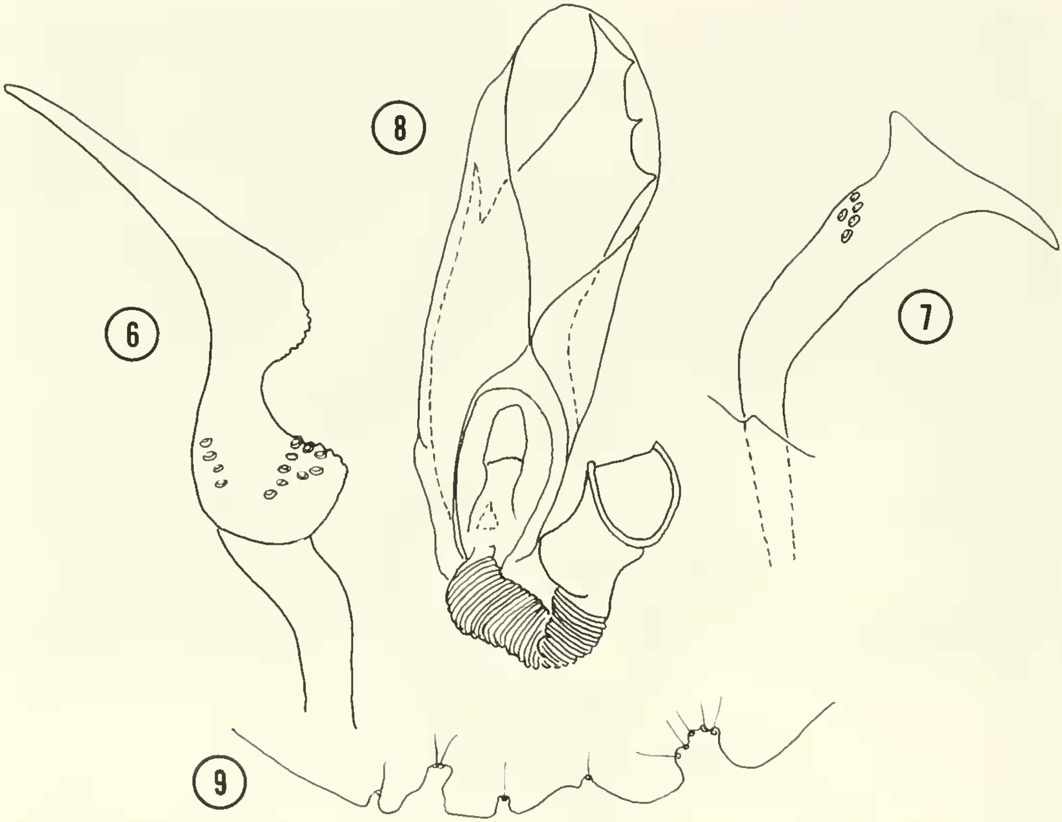
Fig. 1. Dorsal habitus of *Schaffneria davisi*.



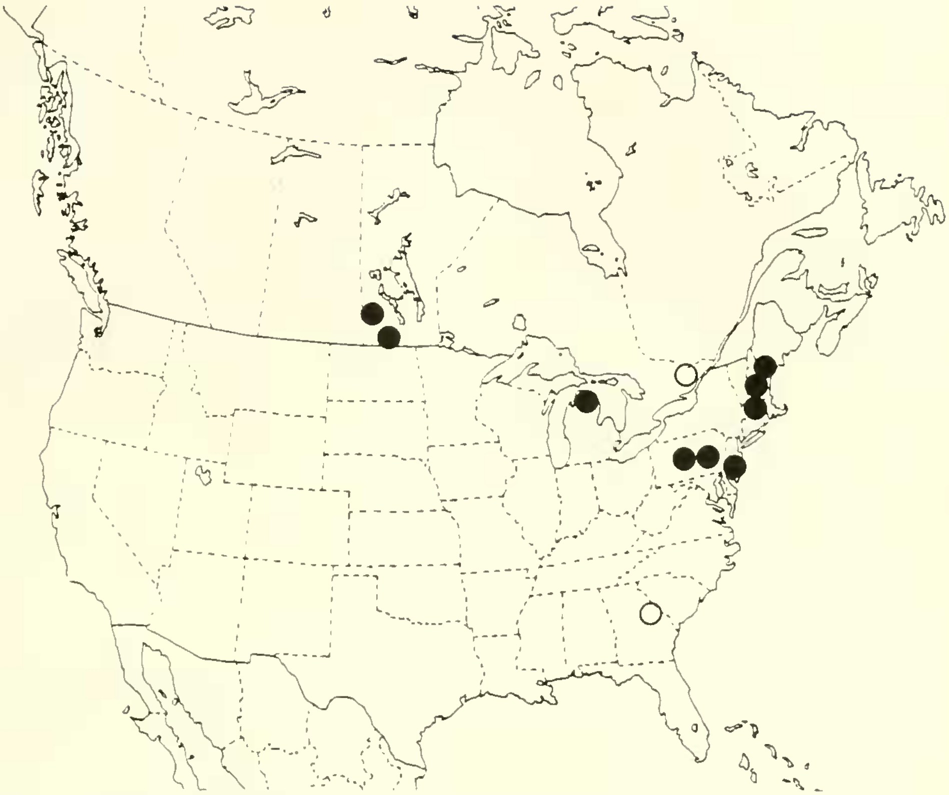
Figs. 6–9. Male genitalia of *Schaffneria davisi*. 6, left paramere. 7, right paramere. 8, aedeagus and phallotheca. 9, dorsal edge of male genital aperture.

ered in Georgia that were found with the red and black *D. mariae* Forel are similarly bicolored. See McIver and Stonedahl (1993) for an excellent review of color and transformational polymorphism in myrmecomorphic spiders and insects, including numerous examples in the Miridae.

Distribution (Map 1).—New Jersey (Knight 1923); Michigan (Knight 1966, as *S. hungerfordi*); Manitoba (Kelton 1980); and Maine, Massachusetts, New Hampshire, and Pennsylvania (Wheeler 1991). New records are Georgia for the United States and Ontario for Canada.

Hosts and habits.—This species is known from bur oak, *Q. macrocarpa* Michx. (Kelton 1980) and scrub oak, *Quercus ilicifolia* (Wheeler 1991). On the basis of specimen data, it also occurs on post oak, *Q. stellata* Wangenh., black oak, *Q. velutina* Lamb., and upland willow, *Salix humilis* Marsh.

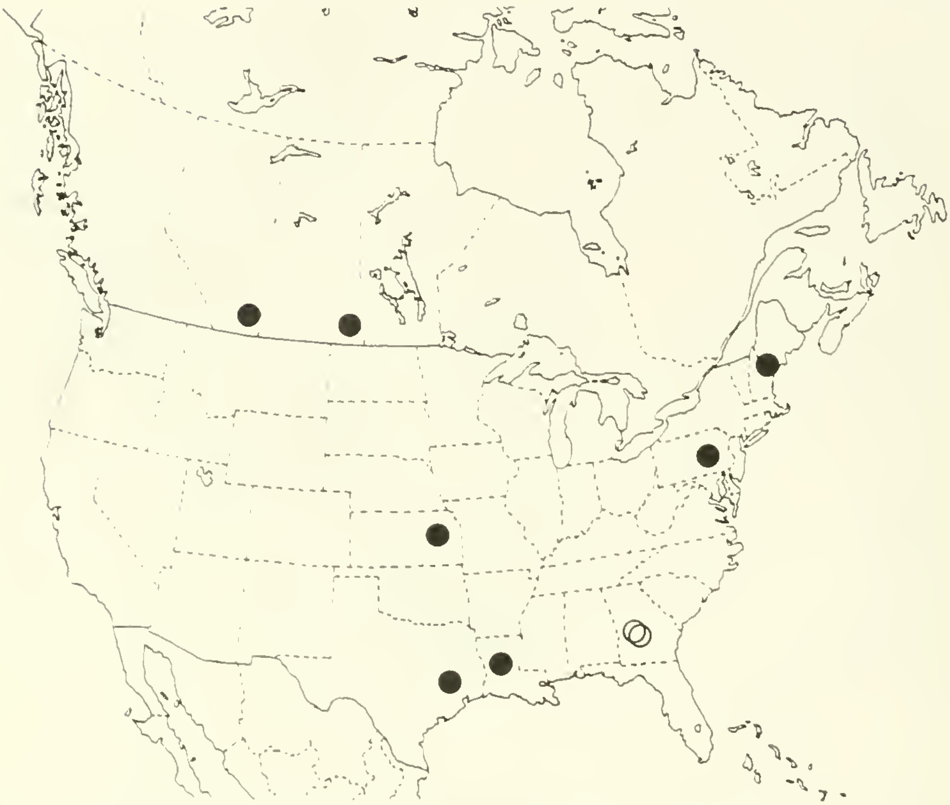
The plant host of this bug appears secondary to its association with certain species of ants that tend aphids. Wheeler (1991) observed *S. davisi* running with *Dolichoderus taschenbergi* that was tending the shiny black aphid *Lachnus allegheniensis* McCook and the yellow aphid *Myzocallis bella* (Walsh). M. D. Schwartz (see "Specimens examined") collected this species with *D. taschenbergi* as well, but on *Salix humilis* it tended another aphid *Chailophorus nigricentris* Richards. In Georgia, A. G. Wheeler and I collected this species with *D. mariae* Forel tending the aphid *Neosymdobius* sp., near *quercihabitus* Miller. At this locality, we observed one individual preying on an unidentified collembolan. Wheeler (1991)



Map 1. Distribution of *Schaffneria davisi*. ○ = new records. ● = old records.

noted that *S. davisi* fed on crushed caterpillars and on aphids unprotected from ants in the laboratory, and speculated that in nature aphids were its primary prey, perhaps supplementing this diet with honeydew and scavenging. Almost certainly these mimetic mirids gain a protective advantage from predators by closely resembling ants. Wheeler (1991) "hypothesized that *S. davisi* derives protection from visual predators that have learned to avoid noxious ants and represents a classic Batesian mimic."

Specimens examined.—CANADA: MANITOBA—1 ♀, Horton, 25 July 1953, Brooks & Kelton (CNC); 1 ♀, Russell, 21 July 1954, Brooks & Wallis (CNC). ONTARIO—4 ♂♂, 18 ♀♀, Ottawa, Carlton Co., Constance Bay, 16–18 July 1991, M. D. Schwartz, taken on *Salix humilis* var. *humilis*, collected with *Chailophorus nigricentris* tended by *Dolichoderus taschenbergi* (CNC). UNITED STATES: GEORGIA—3 ♂♂, 12 ♀♀, Columbia Co., Georgia, Burk's Mt., nr. Pollard's Corner, 24 Apr. 1988, T. J. Henry (TJH) & A. G. Wheeler, Jr. (AGW), taken on *Quercus stellata* with *Dolichoderus mariae* tending *Neosymdobius* sp., near *quercihabitus* (USNM). MAINE—2 ♂♂, Oxford Co., Fryeburg Barrens, 10 Aug. 1990, AGW, on *Quercus ilicifolia* (USNM); 1 ♂, 3 ♀♀, York Co., Waterboro Barrens, 7 Aug. 1990, AGW, on *Quercus ilicifolia*; 1 ♂, 6 ♀♀, York Co., Shapleigh Barrens, 9 Aug. 1990, AGW, on *Quercus ilicifolia* (USNM). MASSACHUSETTS—2 ♂♂, 1 ♀, Franklin Co., Montague Barrens, 4 Aug. 1990, AGW, on *Quercus ilicifolia* (USNM). MICHIGAN—holotype ♂, allotype ♀ (of *S. hungerfordi*), Cheboygan Co., 14 July 1931, H. B. Hungerford (USNM); 2 ♂♂, 2 ♀♀, Presque Isle,



Map 2. Distribution of *Schaffneria pilophoroides*. ○ = new records. ● = old records.

Rt. 33, at Montmorency Co. line, 26 July 1991, TJH & AGW, on *Quercus velutina* (USNM). NEW HAMPSHIRE—1 ♂, 1 ♀, Carroll Co., Ossipee Barrens, 10 Aug. 1990, AGW, taken on *Quercus ilicifolia* (USNM). NEW JERSEY—2 ♀♀, Jamesburg, 4 July 1902, H. G. Barber colln. (USNM); holotype ♀ (of *Pamillia davisi*), Lakehurst, "IX-4," H. H. Knight colln. (USNM); 1 ♂, 3 ♀♀, Lakehurst, 20 June 1903, H. G. Barber colln. (USNM); paratype ♀ (of *P. davisi*), Manumuskin, 15 Sept. '02 (CNC). PENNSYLVANIA—2 ♂♂, 2 ♀♀, Centre Co., Scotia Barrens, 19 July 1990, AGW, taken on *Quercus ilicifolia* (USNM); 15 ♂♂, 24 ♀♀, Schuylkill Co., Rt. 81, 5 mi. S. Frackville, 22–23 July 1986, 1 Aug. 1986, 6 July 1988, 15 Sept. 1990, AGW, taken on *Quercus ilicifolia* associated with *Dolichoderus taschenbergi* tending *Lachnus allegheniensis* (USNM); 13 ♂♂, 9 ♀♀, Schuylkill Co., Rt. 81, 5 mi. S. Frackville, 15 Aug. 1986, TJH & AGW, taken on *Quercus ilicifolia* associated with *Dolichoderus taschenbergi* (USNM).

Schaffneria pilophoroides (Knight)

Fig. 10–19; map 2

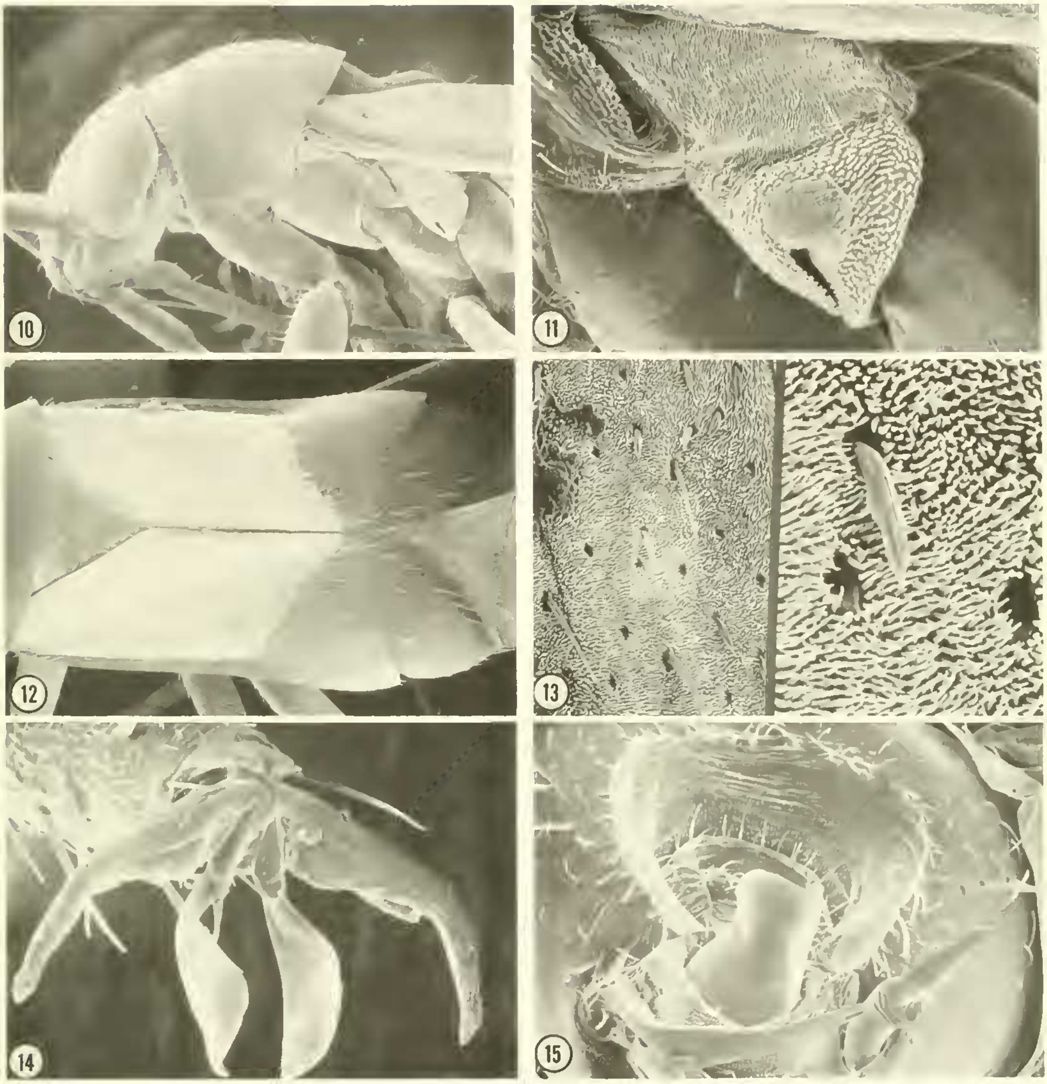
Ceratocapsus pilophoroides Knight, 1930: 197; Carvalho, 1958: 48.

Schaffneria pilophoroides: Knight, 1966: 1; Henry and Wheeler, 1988: 400.

Schaffneria bureni Knight, 1966: 5; Henry and Wheeler, 1988: 400. **NEW SYNONYMY.**

Schaffneria schaffneri Knight, 1966: 2; Kelton, 1980: 213; Henry and Wheeler, 1988: 400; Wheeler, 1991: 427. **NEW SYNONYMY.**

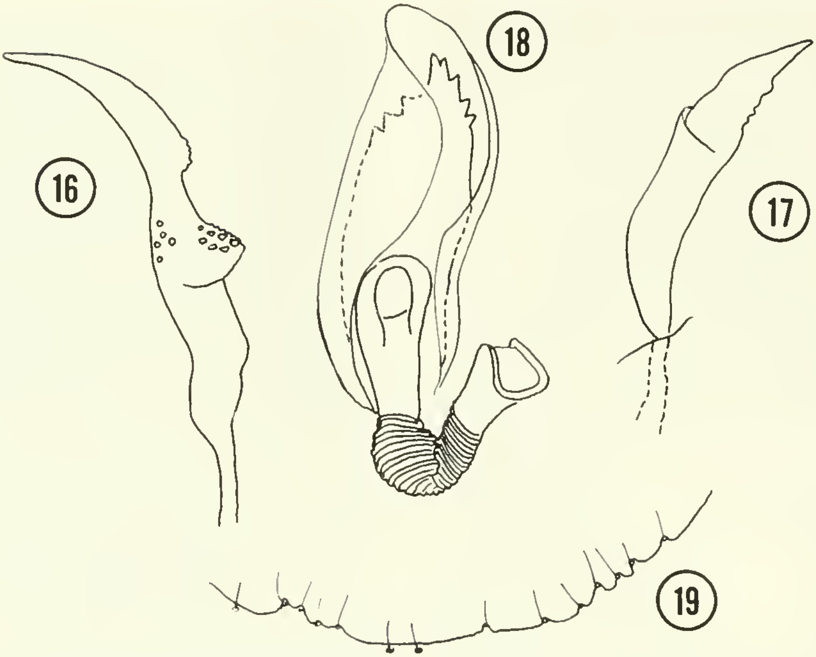
Diagnosis.—*S. pilophoroides* is distinguished from *S. davisi* by the shorter length,



Figs. 10–15. Scanning electron microscope micrographs of *Schaffneria pilophoroides*. 10, lateral aspect of head, pronotum, and scutellum (70.5×). 11, peritreme and ostiolar evaporative area (285×). 12, dorsal aspect of hemelytra (63.0×). 13, split-image dorsal aspect of hemelytra (438×; 1752×). 14, claw (925×). 15, caudal aspect of male genital capsule (247×).

more slender body form, the longer 2nd antennal segment that is much longer than the basal width of the pronotum, the longer 3rd antennal segment that is subequal to or longer than the width of the head, the apically swollen scutellum that is distinctly raised above the level of the hemelytra, and the short, slender, apically acute right paramere.

Knight (1966) separated *S. pilophoroides*, *S. schaffneri*, and *S. bureni* entirely on the color of the wing membrane and infuscations on the pronotum and hemelytra. This variation occurs in longer series of specimens, except perhaps the mostly "white" membrane of *S. pilophoroides* (holotype), which appears abnormally bleached. As noted above, specimens vary from reddish



Figs. 16–19. Male genitalia of *Schaffneria pilophoroides*. 16, left paramere. 17, right paramere. 18, aedeagus and phallotheca. 19, dorsal edge of male genital aperture.

brown to almost completely fuscous or black. The greatest difference among types is the submacropterous condition of the hemelytra on the holotype (*S. schaffneri*) from Texas. However, both fully macropterous and submacropterous individuals are found together in series collected in Pennsylvania. Male genitalia are indistinguishable among the types and other specimens I have examined.

Description.—*Male* (n = 7): Length 2.88–3.16 mm, width across base 0.92–0.96 mm, width across widest part of corium 1.00–1.08 mm. *Head:* Width 0.76–0.78 mm, vertex 0.36–0.40 mm. *Rostrum:* Length 1.28–1.32 mm, extending to bases of metacoxae. *Antenna:* Segment I, length 0.30–0.32 mm; II, 1.20–1.22 mm; III, 0.74–0.80 mm; IV, 0.60–0.62 mm. *Pronotum:* Length 0.66–0.70 mm, anterior width 0.66–0.70 mm, posterior width 0.94–0.98 mm.

Female (n = 7): Length 2.92–3.20 mm, basal width 0.98–1.04 mm, width across widest part of corium 1.22–1.38 mm. *Head:* Width 0.80–0.82 mm, vertex 0.38–0.44 mm. *Rostrum:* Length 1.32–1.34 mm. *Antenna:* Segment I, length 0.30–0.32 mm; II, 1.12–1.20 mm; III, 0.74–0.76 mm; IV, 0.62–0.64 mm. *Pronotum:* Length 0.66–0.76 mm, anterior width 0.64–0.74, posterior width 0.96–1.04 mm.

General coloration fuscous to reddish brown. Head fuscous to reddish brown, finely alutaceous, weakly shiny, with a few scattered erect setae. Antenna uniformly brown, but segments III, IV, and apical half of II often fuscous. Pronotum impunctate, black to reddish brown, shiny, finely alutaceous, moderately convex, disc and anterior half evenly rounded, with a single bristlelike seta at each anterior angle and a few scattered, short, reclining and semierect setae. Scutellum fuscous to reddish brown, uniformly shiny, basal third arched upward to meet base of pronotum, distal two thirds bulbous, swollen above level of hemelytra. Hemelytra bicolored (i.e. reddish brown basally; fuscous apically) to uniformly fuscous to black, lateral margins of basal half subparallel but gradually widening apically to middle of corium, then more abruptly flared around to cuneus; clavus and basal half of corium dulled or matlike (Fig. 12), but see Fig. 13; narrow area through middle of clavus and corium (dulled area) with a glaucous sheen, base and apex of clavus usually fuscous and paler through middle; apical half black to reddish brown and polished, including embolium, apical half of corium outside radial vein, and cuneus; membrane fumate to fuscous, narrowly pale basally along margin of cuneus. Ventral surface polished, black to reddish brown. Male genitalia: Left paramere (Fig. 16); right paramere (Fig. 17); aedeagus and phallotheca (Fig. 18); dorsal edge of genital aperture (Fig. 19).

Remarks.—Like *S. davisi*, this species has several color forms. Specimens taken with *S. davisi* and associated with the uniformly black ant *Dolichoderus taschenbergi* in Pennsylvania are mostly fuscous to black, with some specimens sometimes dark reddish brown through the middle of the hemelytra. Specimens from Georgia and Texas are more uniformly brown to reddish brown, suggesting that they associate with paler-colored ants.

Distribution (Map 2).—Kansas (Knight 1930); Louisiana (Knight 1966, as *S. bureni*); Texas (Knight 1966, as *S. schaffneri*); Alberta and Saskatchewan (Kelton 1980, as *S. schaffneri*); Maine and Pennsylvania (Wheeler 1991, as *S. schaffneri*). Wheeler (1991) and Henry and Froeschner (1992) noted that Henry and Wheeler (1988) incorrectly listed Arizona for the Alberta record of this species (as *S. schaffneri*). Georgia is a new U.S. state record.

Hosts and habits.—*S. pilophoroides* has been taken on the ground under *Juniperus virginiana* L. (Knight 1966), from the grass *Beckmannia syzigachne* (Steud.) Fern. (Kelton 1980), and on *Quercus ilicifolia* Wangenh. (Wheeler 1991).

Like *S. davisi*, this species is associated with certain ants rather than a particular host plant. Wheeler (1991) reported an ant-aphid association similar to that of *S. davisi*, and commented that the defensive habits of these two mirids are probably similar.

It is of interest that the holotype of *S. bureni* was collected by the ant specialist W. F. Buren (Knight 1966). A. G. Wheeler (pers. comm.) informed me soon after his initial discovery of *S. davisi* and *S. pilophoroides* that the best way to find these bugs was to first look for foraging *Dolichoderus* ants.

Specimens examined.—CANADA: ALBERTA—1 ♂, Elkwater Park, 29 July 1952, A. R. Brooks (CNC); 1 ♂, Kenosee. SASKATCHEWAN—19 July 1958, A. & J. Brooks (CNC); UNITED STATES: GEORGIA—1 ♂, Crawford Co., 10 Oct. 1938, W. F. Turner (USNM); 1 ♂, Peach Co., 12 July 1943, W. F. Turner, at light (USNM). KANSAS—holotype ♀ (of *C. pilophoroides*), Topeka, Popenoe, H. H. Knight colln. (USNM). LOUISIANA—holotype ♂ (of *S. bureni*), Alexandria, 8 June 1943, Wm. F. Buren, H. H. Knight colln. (USNM). MAINE—1 ♂, York Co., Waterboro Barrens, 7 Aug. 1990, A. G. Wheeler, Jr. (AGW), taken on *Quercus ilicifolia* (USNM). PENNSYLVANIA—3 ♂♂, 4 ♀♀, Schuylkill Co., Rt. 81, 5 mi. S. Frackville, 22–23 Jul. 1986, 1 Aug. 1986, 6 July 1988, AGW, taken on *Quercus ilicifolia* associated with *Dolichoderus taschenbergi* (USNM); 5 ♀♀, Schuylkill Co., Rt. 81, 5 mi. S. Frackville, 15 Aug. 1986, T. J. Henry & AGW, taken on *Quercus ilicifolia* associated with *Dolichoderus taschenbergi* (USNM). TEXAS—holotype ♂, allotype ♀, 7 ♂ paratypes, 3 ♀ paratypes (of *S. schaffneri*), College Station, 19 Oct. 1963 & 17 & 29 Mar. 1965, J. C. Schaffner (CNC, USNM).

ACKNOWLEDGMENTS

I thank R. C. Froeschner (Dept. Entomol., Natl. Mus. Nat. Hist., Smithsonian Inst., Washington, D.C.), D. C. Ferguson (Syst. Entomol. Lab. (SEL), PSI, ARS, USDA, % Natl. Mus. Nat. Hist., Washing-

ton, DC), R. W. Hodges (SEL), and R. T. Schuh (American Museum of Natural History, New York) for reviewing the manuscript; M. B. Stoetzel (SEL, Beltsville, MD) for certain aphid identifications; D. R. Smith (SEL) for the ant identifications; M. L. Cooley (SEL, retired) for the habitus illustration of *S. davisi*; and Michael D. Schwartz (Biol. Resources Div., Agric. Can., Ottawa) for his Canadian record of *Schaffneria davisi*. A. G. Wheeler, Jr. (Bur. Plant Industry, Pa. Dept. Agric., Harrisburg) also kindly read the manuscript and provided numerous specimens critical to making this study possible.

LITERATURE CITED

Carvalho, J. C. M. 1958. Catalogue of the Miridae of the World. Arquivos do Museu Nacional, Rio de Janeiro. Part III. Orthotylinae 47(3): 1–161.

Carvalho, J. C. M., A. V. Fontes, and T. J. Henry. 1983. Taxonomy of the South American species of *Ceratocapsus*, with descriptions of 45 new species (Hemiptera: Miridae). United States Department of Agriculture Technical Bulletin 1676. 58 pp.

Henry, T. J. 1979. Review of the *Ceratocapsus lutescens* group, with descriptions of seven new species from the eastern United States (Hemiptera: Miridae). Proceedings of the Entomological Society of Washington 81: 401–423.

———. 1985. Two new species of *Ceratocapsus* from North America (Heteroptera: Miridae). Proceedings of the Entomological Society of Washington 87: 387–391.

Henry, T. J. and R. C. Froeschner. 1992. Corrections and additions to the "Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States." Proceedings of the Entomological Society of Washington 94: 263–272.

Henry, T. J. and A. G. Wheeler, Jr. 1988. Family Miridae Hahn, 1833 (= Capsidae Burmeister, 1835). The plant bugs, pp. 251–507. *In* Henry, T. J. and R. C. Froeschner, eds., Catalog of the Heteroptera or True Bugs of Canada and the Continental United States. E. J. Brill, New York & Leiden. 958 pp.

Kelton, L. A. 1980. The plant bugs of the Prairie Provinces of Canada. Heteroptera: Miridae. The Insects and Arachnids of Canada. Part 8. Agriculture Canada Research Publication No. 1703. Ottawa. 408 pp.

Knight, H. H. 1923. Family Miridae, pp. 422–658. *In* Britton, W. E., ed., The Hemiptera or Sucking Insects of Connecticut. Connecticut Geological and Natural History Survey Bulletin 34. 807 pp.

———. 1930. New species of *Ceratocapsus* (Hemiptera: Miridae). Bulletin of the Brooklyn Entomological Society 25: 187–198.

———. 1966. *Schaffneria*, a new genus of ground dwelling plant bugs (Hemiptera: Miridae). Iowa State Journal of Science 41: 1–6.

McIver, J. D. and G. M. Stonedahl. 1993. Myrmecomorphy: Morphological and behavioral mimicry of ants. Annual Review of Entomology 38: 351–379.

Polhemus, D. A. and J. T. Polhemus. 1985. Myrmecomorphic Miridae (Hemiptera) on mistletoe: *Phoradendrepulus myrmecomorphus* n. gen., n. sp. and a redescription of *Pilophoropsis brachypterus* Poppius. Pan-Pacific Entomologist 61: 26–31.

Schuh, R. T. 1974. The Orthotylinae and Phylinae (Hemiptera: Miridae) of South Africa with phylogenetic analysis of the ant-mimetic tribes of the two subfamilies for the world. Entomologia Americana 47: 1–322.

———. 1984. Revision of the Phylinae (Hemiptera: Miridae) of the Indo-Pacific. Bulletin of the American Museum of Natural History 177: 1–476.

Wheeler, A. G., Jr. 1991. Plant bugs of *Quercus ilicifolia*: Myriads of mirids (Heteroptera) in pitch pine-scrub oak barrens. Journal of the New York Entomological Society 99: 405–440.

Wheeler, A. G., Jr. and T. J. Henry. 1980. Seasonal history and host plants of the ant mimic *Barberiella formicoides* Poppius, with description of the fifth-instar (Hemiptera: Miridae). Proceedings of the Entomological Society of Washington 82: 269–275.